

OPERATION AND SERVICE MANUAL

240L Broadband Power Amplifier



OPERATION & SERVICE MANUAL

240L

Broadband Power Generator



HIGH RF VOLTAGES MAY BE PRESENT AT THE OUTPUT OF THIS UNIT. All operating personnel should use extreme caution in handling these voltages and be thoroughly familiar with this manual.



DO NOT USE ANY CFC (CHLOROFLUOROCARBON) SOLVENT IN THE MAINTENANCE OF THIS PRODUCT. In recognition of our responsibility to protect the environment, this product has been manufactured without the use of CFC's. The no-clean flux now used in all soldering operations may leave a small inert residue which will not affect the performance of the product. The use of CFC's for cleaning or maintenance may result in partial liquification of the no-clean flux residue, which will damage the unit and void the warranty.

Notice

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Warranty

ENI warrants to the original purchaser for a period of one year from the date of delivery, each instrument to be free from defects in materials and workmanship. For a period of one year, ENI will, at its option, adjust, repair, or replace defective parts, without charge to the original purchaser, so that the instrument performs according to its specifications.

When warranty service is required, the instrument must be returned, transportation prepaid, to the factory or to one of ENI's designated service centers. If, in our opinion, the instrument has been damaged by accident, unreasonable use, buyer-supplied software or interfacing, improper site preparation or maintenance, or abnormal conditions of operation, repairs will be billed at standard rates. In this case, an estimate will be submitted before the work is started.

THIS LIMITED WARRANTY IS EXCLUSIVE AND ENI MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, AND ALL OTHER EXPRESS ORAL OR WRITTEN WARRANTIES AND ALL WARRANTIES IMPLIED BY LAW, INCLUDING ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR OTHER WARRANTY OF QUALITY ARE EXCLUDED AND DISCLAIMED. IN NO EVENT SHALL ENI BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM BREACH OF ANY WARRANTY, WHETHER EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR FROM ANY CAUSE WHATSOEVER, INCLUDING NEGLIGENCE. Buyer's sole and exclusive remedy under this warranty shall be repair or replacement as set forth above, or if ENI is unable to repair or replace the defective part within a reasonable time, a refund of the price of the part or goods which give rise to the warranty claim.

Service and Technical Assistance

For **Technical Support** for your particular application, contact the nearest ENI Sales and Service Center. The following information will help us provide you with prompt and efficient service:

- All of the information contained on the unit's name plate.
- Detailed description (i.e. physical damage and/or performance anomalies, quantitative and/or qualitative deviation from specifications), including miscellaneous symptoms, dates and times.
- The environment and circumstances under which the issue developed.
- Names and telephone numbers of important contacts.
- Supporting test data and/or records that can be provided.
- Any previous, related conversations and/or correspondence with ENI.

For **Service or Repair** contact the closest Customer Service Department with the following information:

- Model and serial number
- Detailed description of malfunction
- Purchase order number
- Your company's "Bill To" and "Ship To" address

You will receive a RMA (Return Materials Authorization) number, the warranty status of the unit to be returned and estimated repair charge, if any. The RMA number is your authorization number. Please type this number on your purchase order and shipping label. After ENI receives the unit, a firm quote and estimated date of completion will be given.

Sales and Service Locations

ENI East Coast	A Division of Astec America, Inc., 100 Highpower Road, Rochester, NY 14623		
	Tel: (716) 427-8300	Fax: (716) 427-7839	Service: (716) 292-7478
ENI West Coast	2065 Martin Ave., Suite 101, Santa Clara, CA 95050		
	Tel: (408) 727-0993	Fax: (408) 727-1352	
ENI Europe	Mundells Court, Welwyn Garden City, Hertfordshire AL 1EN England		
	Tel: (0707) 371558	Fax: (0707) 339286	
ENI Germany	Holderäckerstrasse 14, D-7016 Gerlingen, Germany		
	Tel: 07156-21095	Fax: 07156-49372	
ENI Japan	541 Aoyogi, Kunitachi, Tokyo 186, Japan		
	Tel: 0425 229011	Fax: 04025 222636	
	Fujita Bldg 4F, 2-27 Nishitenmna 3-chome, Kita-Ku, Osaka 530, Japan		
	Tel: 06-367-0823	Fax: 06-367-0827	

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Glossary of Abbreviations

Chapter 1

Introduction

1.1 Introduction

The Model 240L is a broadband solid state power amplifier covering the frequency range of 20 kHz to MHz.

More than 40W of RF power can be produced at the output, with low harmonic and intermodulation distortion. Up to 200W of saturated power can be produced with increased distortion products. A highly linear Class A design, the Model 240L will amplify inputs of AM, FM, SSB, pulse and other complex modulations. The 50 dB gain of the unit is unconditionally stable and will not oscillate for any possible combination of source and load impedance. It is protected against failure due to output load mismatch and/or overdrive.

Output RF voltage level, as well as power output into 50 Ω , is monitored by a front panel meter. An integral power supply permits operation from 115/230 single phase AC power.

1.2 Specifications

Physical and electrical specifications are listed in Figure 1.

Chapter 2

Operation

2.1 Introduction

The ENI 240L RF amplifier is used to increase the r.f. output level of signal sources in the 20 kHz to 10 MHz range. No tuning or any other form of adjustment is required other than the selection of the correct power supply input voltage.

The 240L produces rated power output connector, regardless of load impedance. Any power reflected due to output load mismatch is absorbed in the amplifier. Therefore, although the output impedance is 50 Ω (typical VSWR:1.5:1), the amplifier will work into any load impedance.

2.2 Rack Installation

For standard nineteen inch relay rack installations, rack mounting brackets are supplied with the unit. Remove the two #8-32 screws on each side of the cover nearest the front panel. Attach the rack mounting brackets firmly using the hardware removed above. The rubber feet may be unscrewed and removed if the minimum vertical usage of the relay rack is necessary.

2.2.1 Mains Voltage Setting

The supply voltage selection switch is located at the rear of the instrument and is normally set for 115 VAC operation.

Before connecting the unit to the mains supply, check that the supply voltage selection switch is correctly set. Extensive damage will result if the Amplifier is connected to the wrong supply voltage. Under no circumstances should this switch be operated while the supply is connected.

2.2.2 Mains Fuse Rating

The mains fuse F1 is located on the rear panel. The replacement part number details are:

115 V	8 amp	Slow Blow	ENI Part No. 313008
230 V	4 amp	Slow Blow	ENI Part No. 313004

2.2.3 Mains Lead Connection

For 230 VAC operation, a suitable mains supply plug must be fitted to the mains lead attached to the instrument. The three conductors are color coded as follows:

BLACK	-	Live
WHITE	-	Neutral
GREEN	-	Earth

2.3 Operation

Determine and adjust the voltage setting and fuse rating as described in the previous sections 2.2.1 and 2.2.2 then proceed as follows:

- (i) Ensure input voltage is not excessive

The 1 V rms indicated maximum input voltage is 5 times the level of the input signal required to achieve maximum output. Input voltages in excess of 2V peak may permanently damage the instrument.

- (ii) Connect the input signal via a 50 Ω coaxial lead and BNC plug to the input connector.
 - (iii) Connect the output via a 50 Ω coaxial lead and BNC plug to the load.
-

Chapter 3

Technical Description

3.1 General Description

The ENI 240L is designed to amplify signals by 50 dB in the frequency band 20 kHz to 10 MHz. The signal from the front panel BNC connector is fed via a length of 50 Ω coaxial cable into the input of the driver/combiner module (240L-4302). The signal at the collector of Q1 is amplified further by transistor Q2. The output signal at the collector of Q2 is then split into two equal phase and amplitude signals by transformer T2. The two output signals from T2 are fed to the bases of Q3 and Q4. The output signals of transistors Q3 and Q4 are combined in transformer T3, impedance matched in transformers T4 and T6 and split into two equal phase and amplitude signals by transformer T7. These output signals are fed to connectors J3 and J4 which are fed via coaxial cables to the inputs of the two power amplifier modules (240L-4301).

The signal applied at J5 is impedance matched and split into two equal phase and amplitude signals by transformers T1 and T2. The signals at the outputs of T2 are split and phase reversed by transformers T3 and T4. The outputs of transformers T3 and T4 are fed to the bases of Q1, Q2 and Q3, Q4 respectively. The power outputs of Q1 and Q2 are combined in the phase reversing transformer T5 and the power outputs of Q3 and Q4 are combined in phase reversing transformer T6. The output signals from T5 and T6 are combined and impedance matched to 50 Ω at the output connector J7 by transformers T7 and T8.

The output signals from the two power amplifier modules (240L-4301) are fed via coaxial cables to J9 and J10 of the driver/combiner module (240L-4302). These two signals are combined by hybrid transformer T8. Capacitor C18 and transformer T9 match the combined RF output signal to 50 Ω at connector J11. The output signal is fed via a 50 Ω coaxial cable to the RF voltmeter module J12 (3100L-4206).

The signal at J12 is connected via a length of microstrip transmission line to the output BNC connector J13. Off of this microstrip line resistors R1, R2, R3 and R4 make up a high impedance voltage divider. A fast switching hot carrier diode CR1 rectifies the RF voltage from the divider. A wire gimmick (capacitor C2) compensates for the high frequency roll-off of the diode CR1. Resistors R4, R5, R6 and capacitor C1 filter the rectified RF and convert it to DC which is fed to the front panel meter (M1).

The amplifier power requirements are 115 V or 230 VAC. at 450W. The power supply unit provides a 36 VDC, 7.0A source and a 21VDC 40 mA source. The 36VDC source is regulated by series pass transistors Q1, Q2, Q3 and Q4 and integrated circuit regulator IC1. R3 adjusts the supply to 36V. The front panel light and the RF voltmeter are connected to the 21VDC source and the lamp will indicate when the power supply is operating correctly.

Chapter 4

Maintenance

4.1 Introduction

The ENI 240L RF amplifier requires no periodic maintenance. The instrument is unconditionally stable and is failsafe under all load conditions. Damage can only be externally caused by the incorrect selection of the supply voltage or by an input signal in excess of the specified 1V rms maximum.

This chapter therefore, deals only with certain fundamental procedures for fault location and with the subsequent re-alignment procedures.

Performance limits quoted are for guidance only and should not be taken for guaranteed performance specifications unless they are also quoted in Figure 1.

4.2 Access and Layout

The ENI 240L RF amplifier is housed in an aluminum chassis. The cover can be removed by releasing the eight #8-32 screws on the side of the unit and the eight #4-40 flat head Phillips head screws on the top of the unit and lifting by the handle.

The rear panel supports the mains fuse holder, the mains input voltage selector switch (S2) and the cooling fan.

4.3 Performance Checks

To determine the amplifier's performance carry out the following procedure.

4.3.1 Initial Check

The following check can be made after repair and adjustments or whenever the condition of the unit is in question.

- (i) Connect power supply. Switch on power and observe that the supply lamp (DS1) illuminates.
- (ii) Connect a sweep generator (HP 8601 or similar) capable of sweeping the frequency range 20 kHz to 10 MHz to the input connector.
- (iii) Adjust the output level of the sweep generator so that a 50 Ω video detector connected at the output of the unit will not be damaged by excessive power output.
- (iv) Observe the gain versus frequency ripple on an oscilloscope calibrated in decibels. The gain variation must be not more than ± 1.5 dB over the frequency range.
- (v) Connect a calorimetric power meter (HP434 or equivalent) through a 10 dB 100W attenuator to the output connector. Adjust the input CW signal to any frequency between 20 kHz and 10 MHz for 40W output.
- (vi) Observe the harmonic distortion of the output of a spectrum analyzer. The harmonic components contributed by the amplifier should be at least 25 dB down from the fundamental.

If the requirements of this check are not met, verify that:

- (a) The mains supply switch and fuse are correctly selected and that DSI is illuminated.
- (b) The power supply voltage is set at 36V by R3.

If the above checks are found to be correct, then normal fault location procedures, with reference to the circuit diagram Reference 1 should be followed to determine the correct operation of the driver/combiner and power amplifier modules.

4.4 Re-Alignment Procedure

Before any adjustment is made to the unit, first:

- (i) Ensure that the mains switch and fuse are correctly selected and that DSI is illuminated.
- (ii) Measure the power supply voltages and adjust per section 4.3.1 (b).

4.4.1 Measurement of Gain

Equipment required:

- | | |
|----------------------------|---------------------------|
| (a) Oscilloscope | - Telequipment Model S54A |
| (b) Sweep/Signal Generator | - HP8601A |
| (c) 50 Ω Detector | - Wavetek D151 |
| (d) Attenuator, 10dB, 20W | - Narda 766-10 |

Connect the equipment as shown in Figure 2, then proceed as follow:

- (a) Set the oscilloscope to DC, time/CM to Ext.X, and vertical gain to 10MV/CM.
- (b) Set the sweep/generator to the S/S mode with the start frequency at 20 kHz and the sweep width to 10 MHz.
- (c) Disconnect the ENI 240L from the set-up and connect the sweep/generator RF output directly to the 10dB attenuator.
- (d) Adjust the output level of the sweep/generator for full vertical deflection on the oscilloscope face.
- (e) Calibrate the scope face to show 3 dB in 1 dB steps by attenuating the sweep/generator in 1 dB steps and marking the traces with a grease pencil.
- (f) Return sweep/generator output level to full deflection. Rotate the step attenuator on the sweep/generator (CCW) so that the output is reduced by 50 dB.
- (g) Reconnect the 240L into the test set-up of Figure 2.

- (h) Place the 240L power switch to the "on" position.
 - (i) Observe the gain versus frequency sweep on the oscilloscope.
 - 1. The average gain should be 50 dB (within 1 dB).
 - 2. The gain variation should be within the 3 dB markings as shown on the oscilloscope.
-

4.4.2 Measurement of Harmonics

Equipment required:

- | | | |
|-----|--------------------------|---|
| (a) | Sweep/signal generator | HP8601A |
| (b) | Attenuator, 30 dB | Bird 8321 |
| (c) | Calorimetric Power Meter | HP434A |
| (d) | Spectrum Analyzer | HP140T Display Unit
HP8554L Spectrum Analyzer
RF Section
HP8552A Spectrum Analyzer
IF Section |
| (e) | Attenuator, 10dB | Bird 8341 |

Connect the Equipment as shown in Figure 3 then proceed as follows:

- (a) Adjust the sweep/signal generator at a CW center frequency of 4 MHz for an indicated output of 40W on the power meter.
 - (b) Using the spectrum analyzer, check that the level of the carrier harmonics less than -25 dB with respect to the carrier.
-

4.5 Packaging for Reshipment

In the event of the equipment being returned for servicing it should be packed in the original shipping carton and packing material. If this is not available, wrap the instrument in heavy paper or plastic and place in a rigid outer box of wood, fiberboard or very strong corrugated cardboard. Use ample soft packing to prevent movement. Provide additional support for projecting parts to relieve these of unnecessary shock. Close the carton securely and seal with durable tape. Mark the shipping container FRAGILE to ensure careful handling.

Chapter 5

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	RF Voltmeter Board (240L-4305)	A-5

Glossary of Abbreviations

240L Specifications

Frequency Coverage:	20kHz to 10MHz
Gain:	50dB, ± 1.5 variation
Class A Linear Output:	40 Watts
Harmonic Distortion:	Typically more than 28dB below fundamental at 40 Watts output.
Saturated RF Power Output:	Greater than 50 Watts 20kHz to 10MHz Greater than 100 Watts 30kHz to 4MHz Greater than 150 Watts 40kHz to 2MHz
Input/Output Impedance:	50 Ω , VSWR 1.5 maximum
Noise Figure:	8dB maximum
Stability:	Unconditionally stable
Protection:	Unit will withstand more than 16dB overdrive for all output load conditions.
Output Meter:	Average reading voltmeter calibrated in volts (0-100V) also calibrated in watts into 50 Ω (0-200W), $\pm 5\%$ accuracy.
Power Requirements:	115-230VAC $\pm 8\%$ at 450 Watts
Size:	7 x 10 x 16.5 inches 17.8 x 25.4 x 41.9 cm.
Weight:	35 pounds 15.9 kg
Connectors:	BNC

Gain Measurement

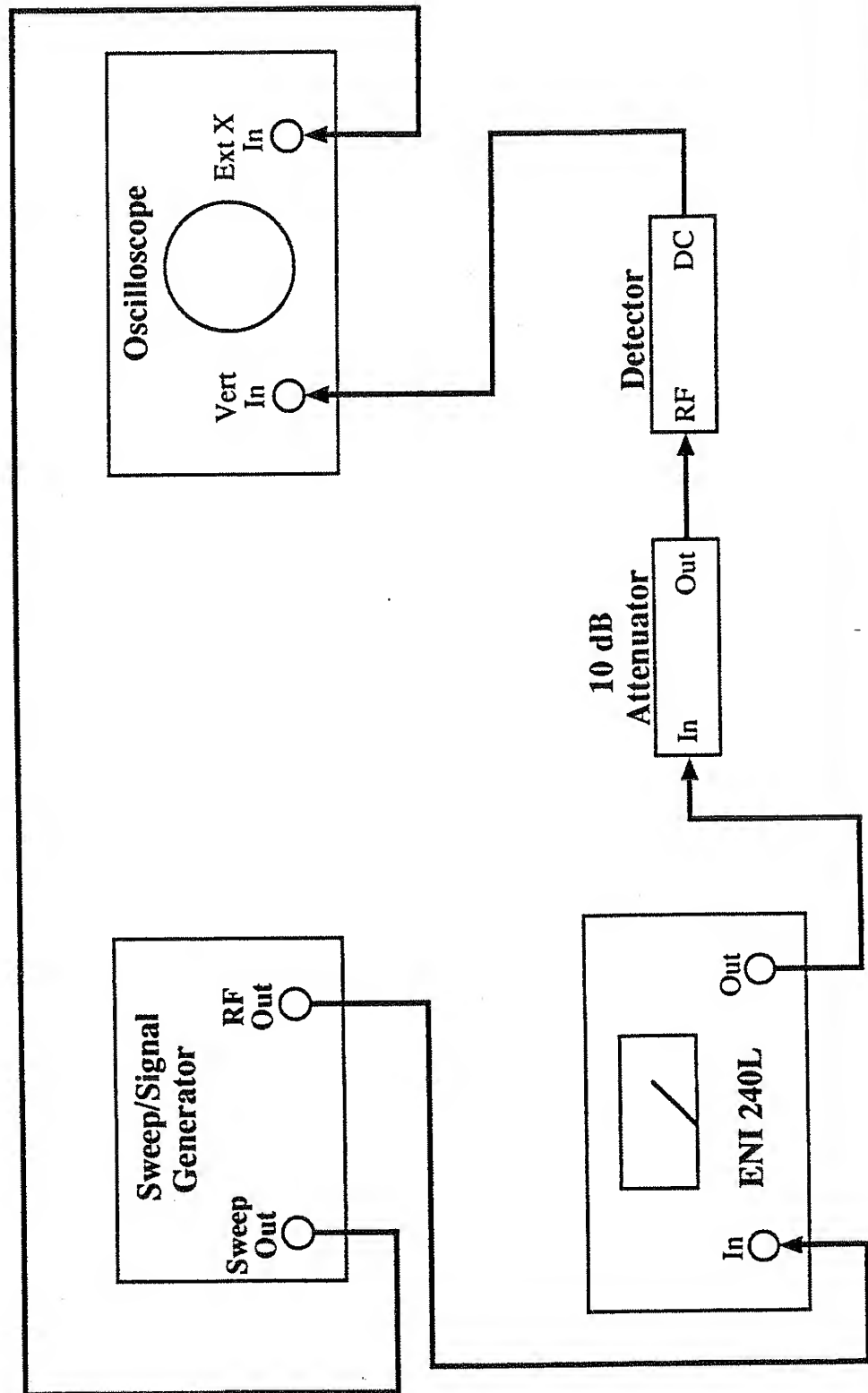


Figure 2

Harmonic Measurement

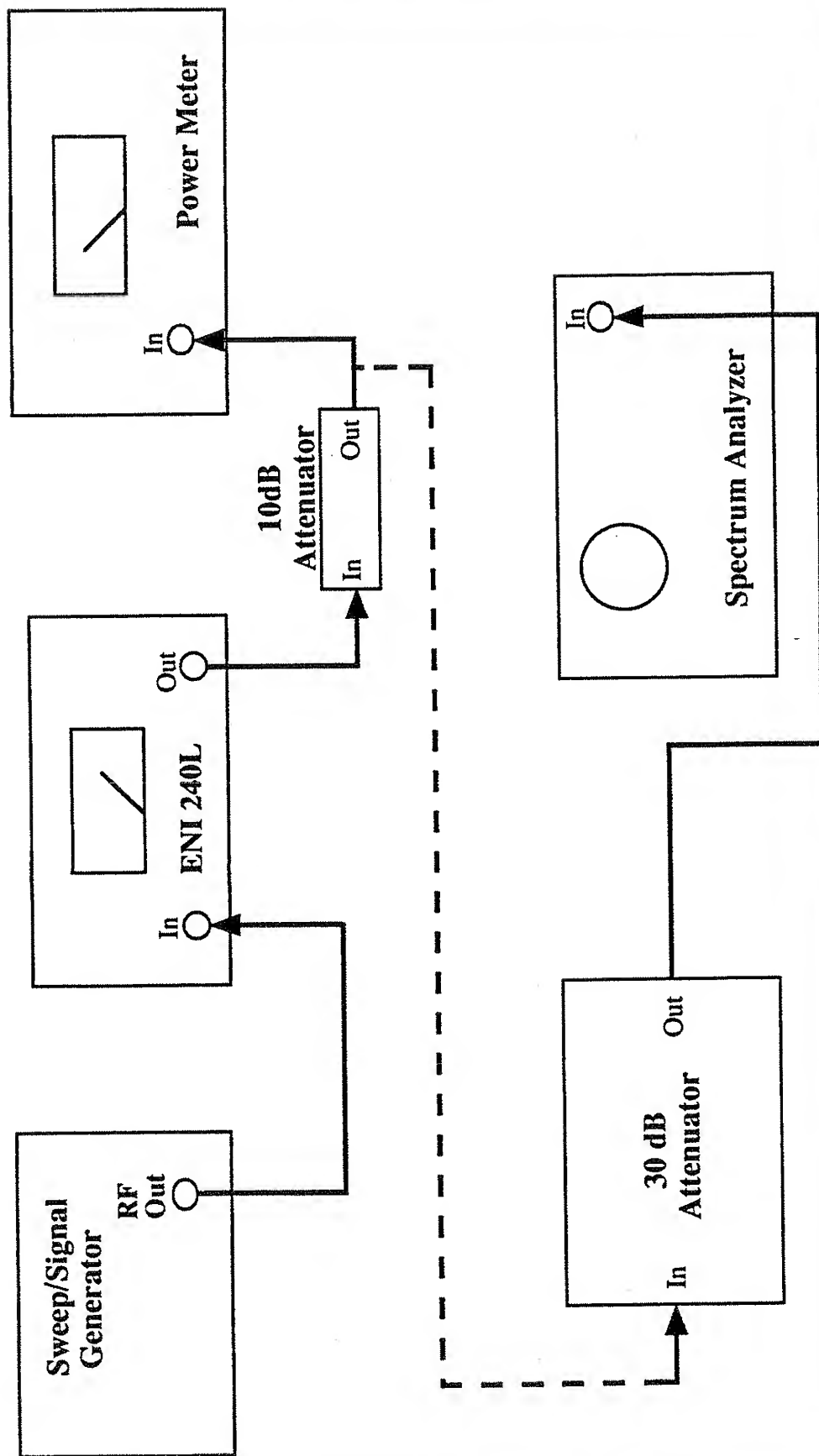


Figure 3

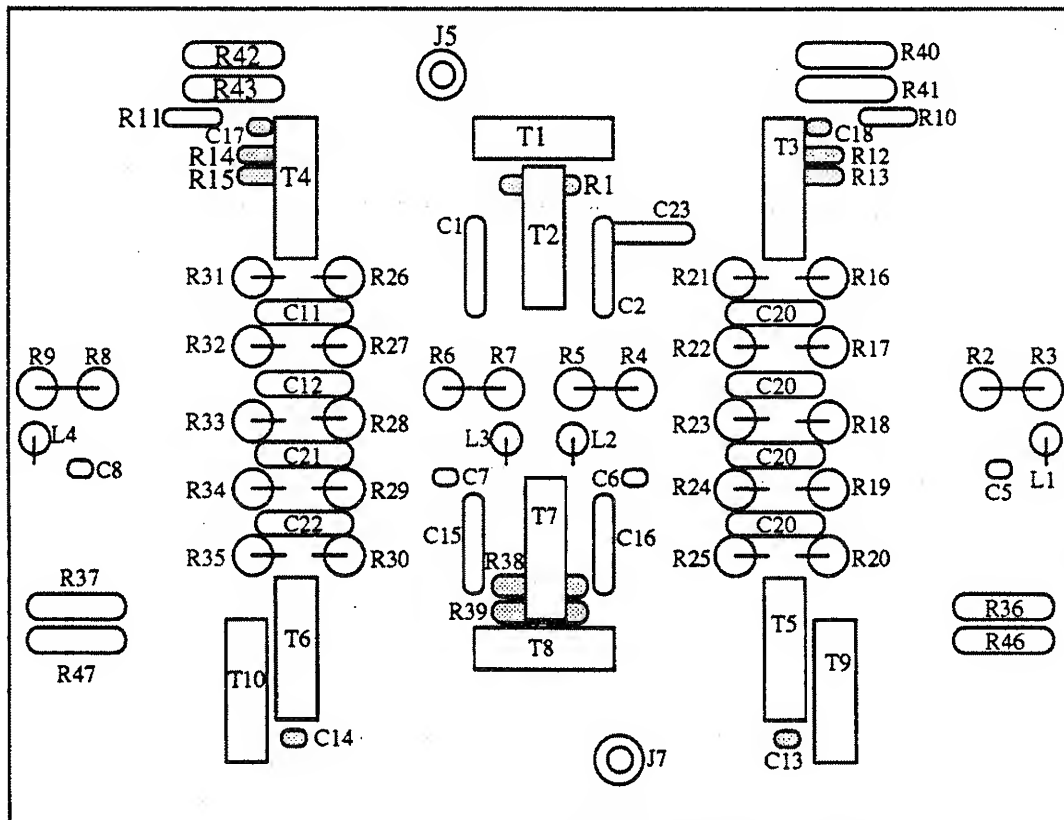
Outline Drawings

A.	Power Amplifier Board	(240L-4301)	A-1
B.	Driver / Combiner Board	(240L-4302)	A-2
C.	P.S. Transistor Board	(240L-4303)	A-3
D.	P.S. Regulator Board	(240L-4304)	A-4
E.	RF Voltmeter Board	(240L-4305)	A-5

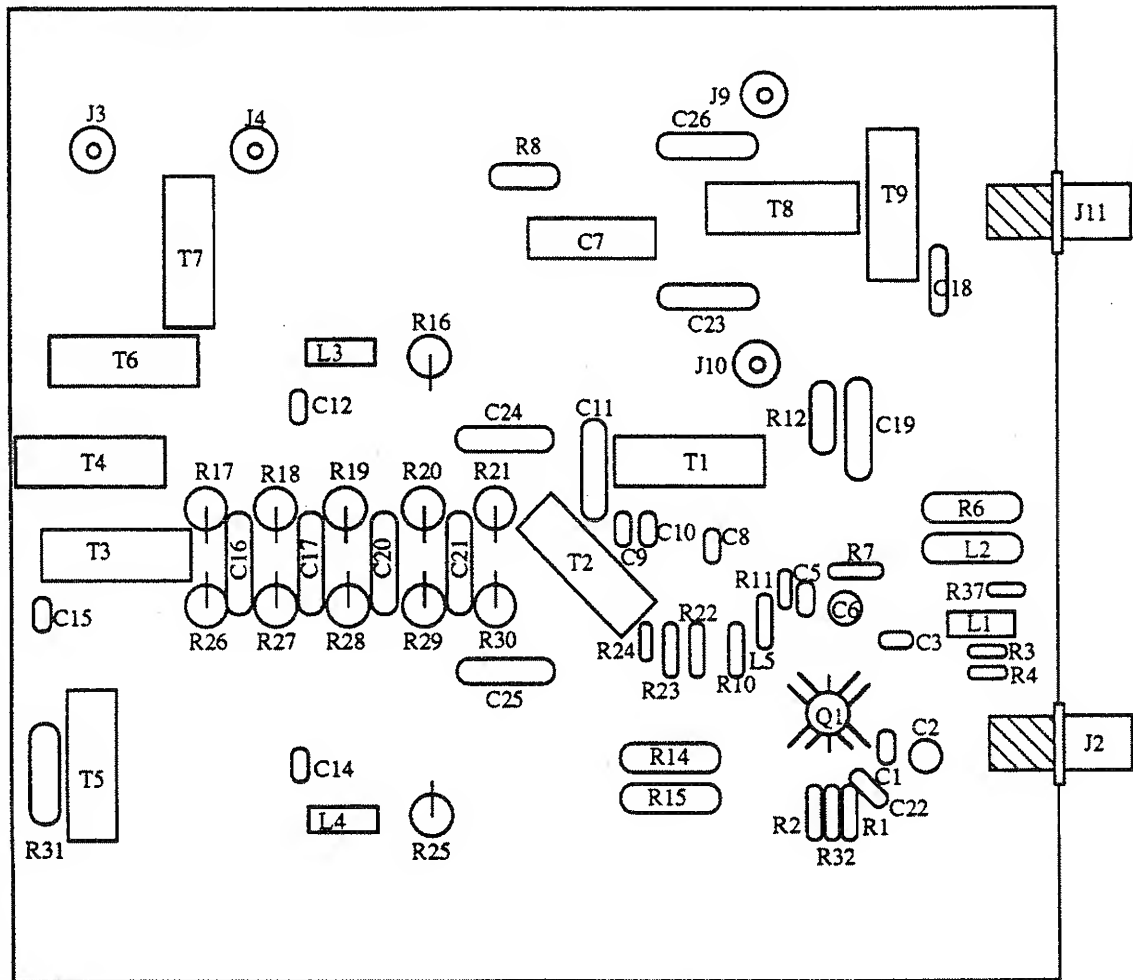
Parts List

240L-1301

240L Power Amplifier Board (240L-4301)

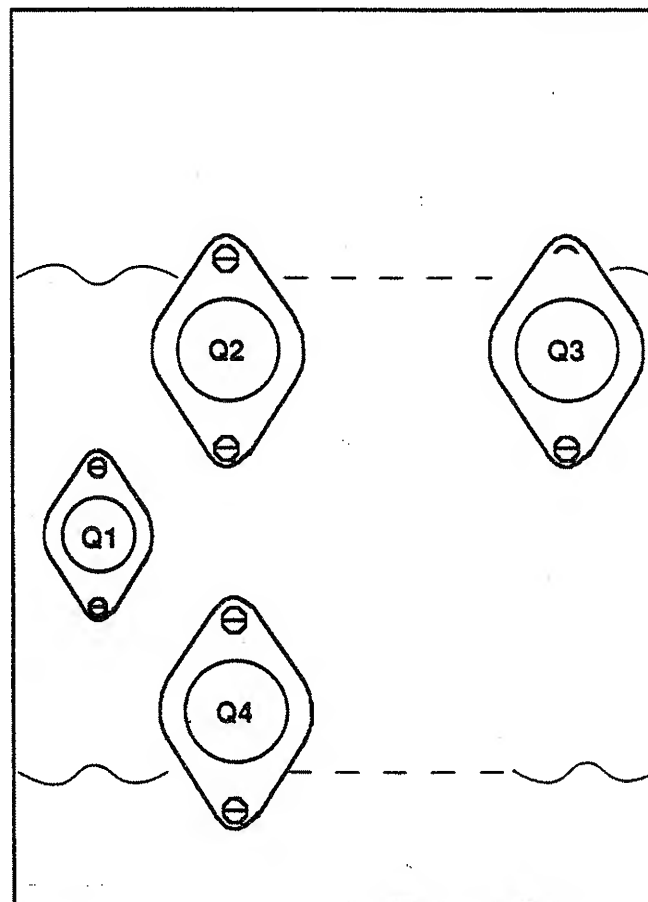
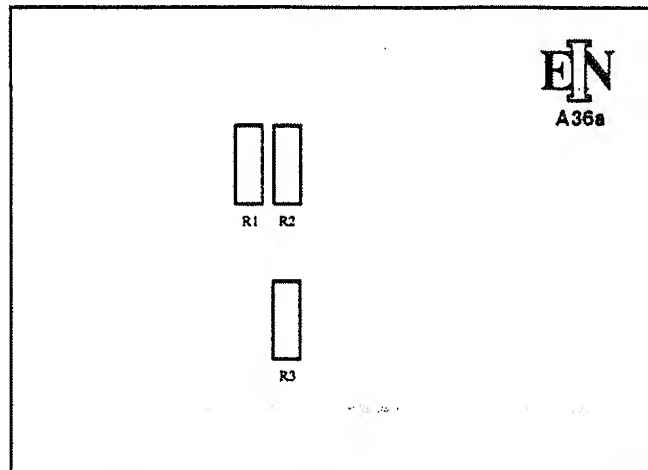


240L Driver/Combiner Board (240L-4302)



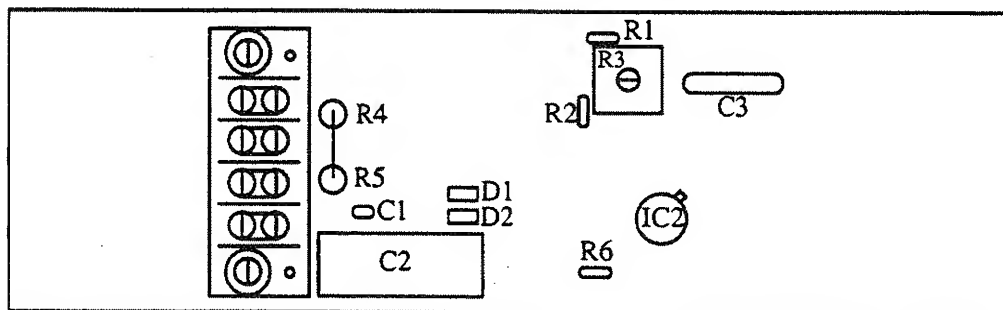
240L Power Supply Transistor Board Assembly (240L-4303)

Front of Board

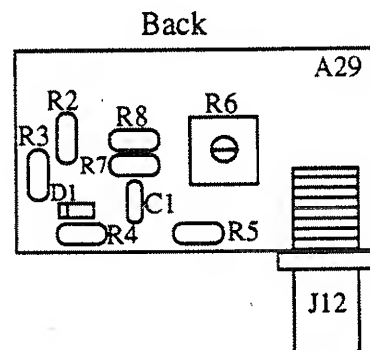
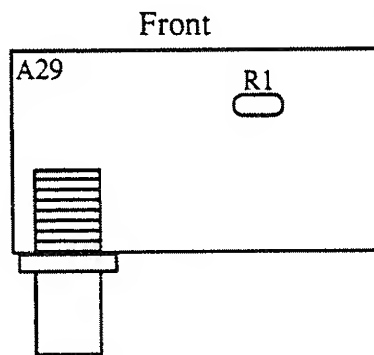


Back of Assembly

240L Power Supply Regulator Board
(240L-4304)



240L RF Voltmeter Board (240L-4305)



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240L SCHEMATIC DIAGRAMS

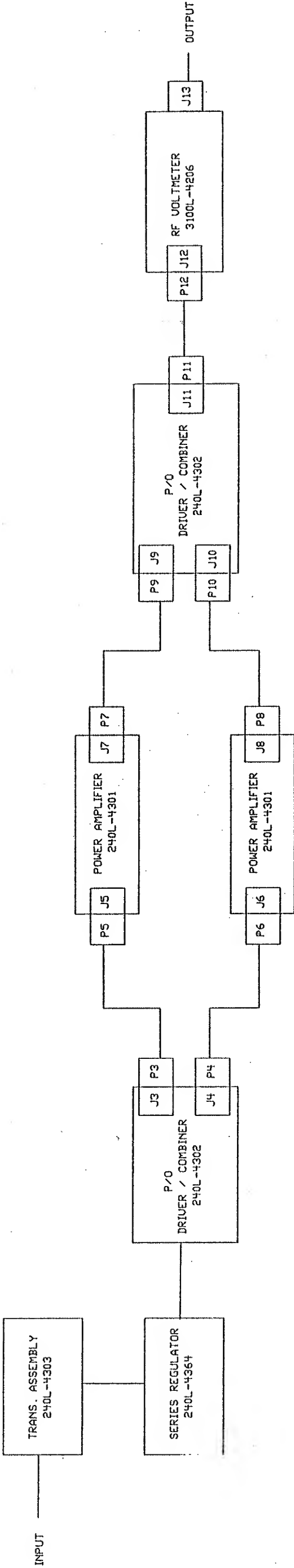
DRAWING NAME
240L BLOCK DIAGRAM
240L POWER WIRING
240L DRIVER / COMBINER
240L POWER AMPLIFIER

REFERENCE DWG
240L-SCH-02
240L-SCH-03
240L-SCH-04
240L-SCH-05

FILE NAME
240L.BLK
240L.PWR
240L.P1
240L.P2

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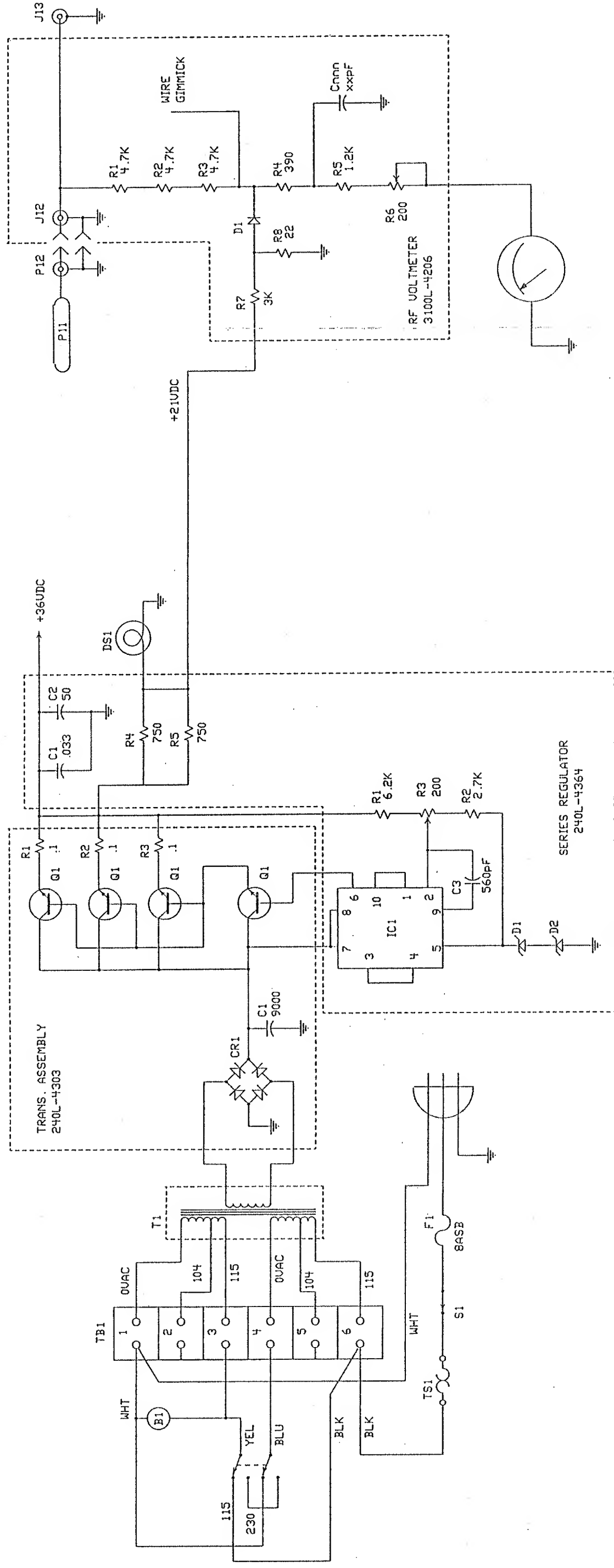
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B	ECO #3348	May	12/90
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NOTES: (UNLESS OTHERWISE SPECIFIED)

1. A. ALL RESISTOR VALUES ARE IN OHMS.
2. B. ALL CAPACITOR VALUES ARE IN MICROFARADS.
3. C. ALL INDUCTOR VALUES ARE IN MICROHENRIES.
4. VOLTAGE MEASUREMENTS TAKEN WITH NO SIGNAL APPLIED, USING A VOLTMETER WITH A HIGH INPUT IMPEDENCE (10 MEGOHMS OR GREATER).
5. ALL VOLTAGES ARE DC POSITIVE WITH RESPECT TO GROUND.
6. * INDICATES VARIABLE VALUE.



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POWER WIRING
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240L

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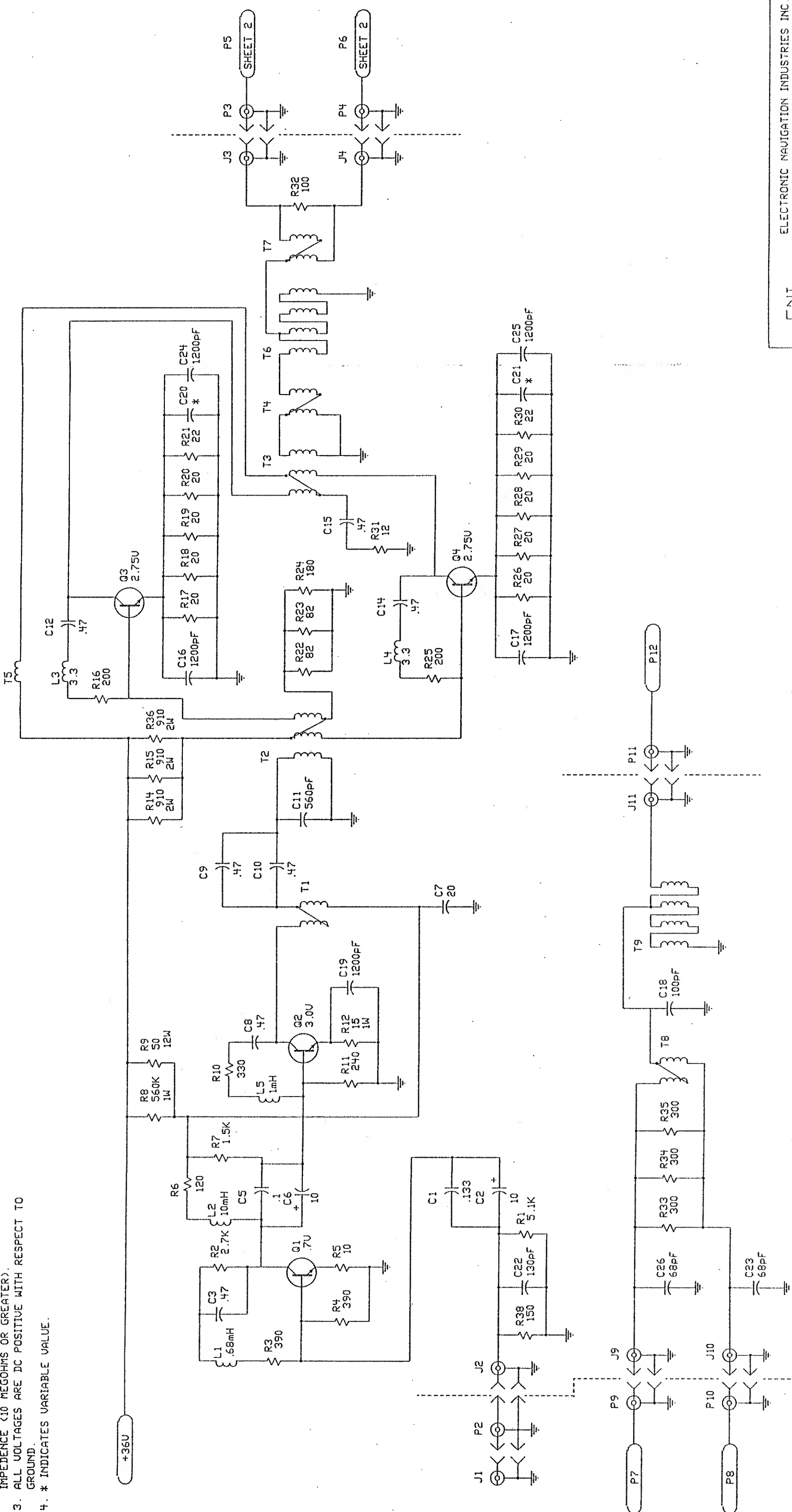
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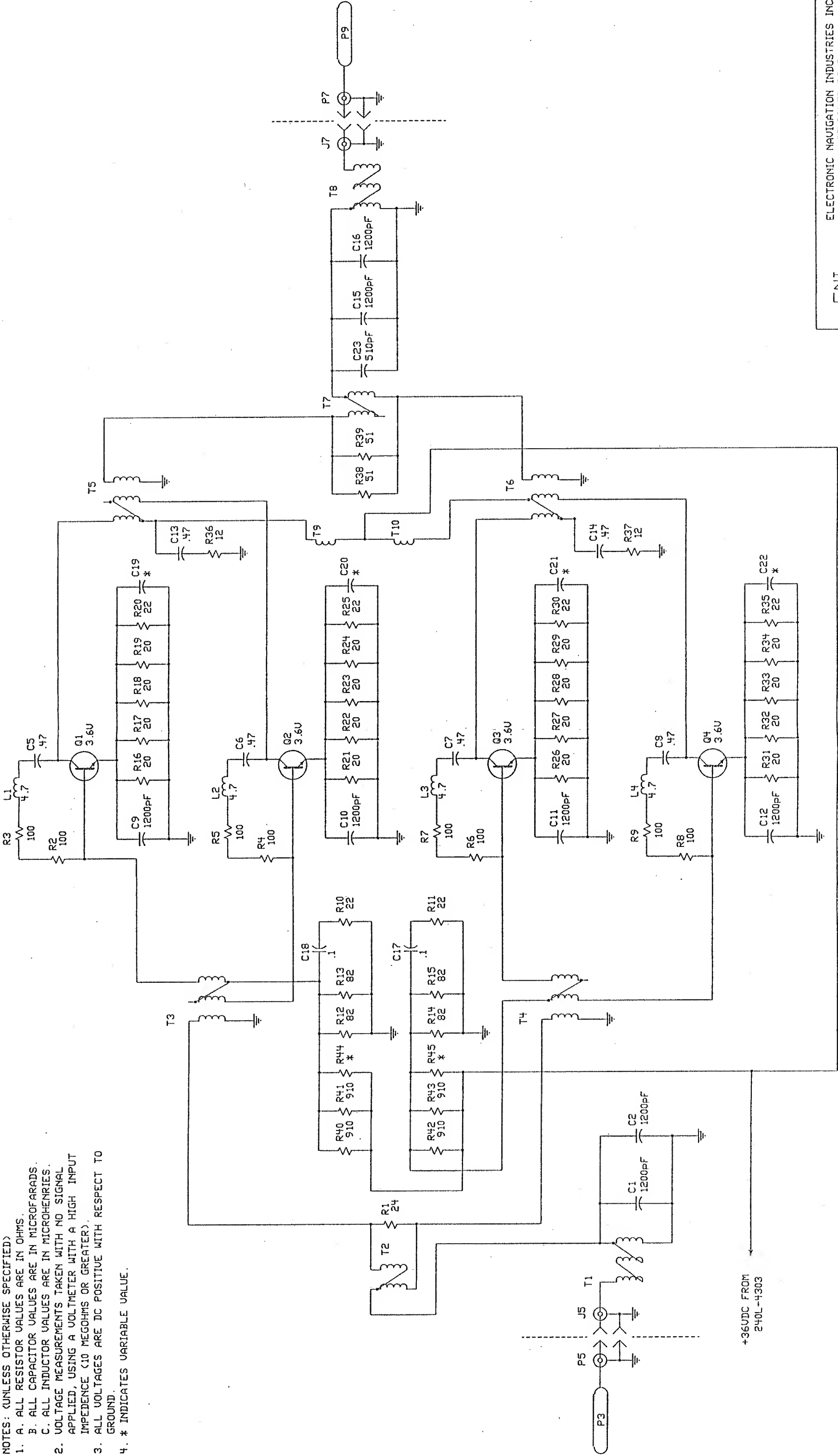


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DRIVER / COMBINER	240L
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B	ECO #3348		12/90	ENG.		

POWER AMPLIFIER	REV
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240L-4301	
DWG. NO. 240L-SCH-05	
SHEET 1 OF 1	

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ROCHESTER, NEW YORK 14623

PAGE	PART NUMBER	DESCRIPTION	QTY
1	240L-1301	240L POWER AMPLIFIER	0.000
	240L-009	RACK MOUNTING BRACKET	2.000
2	240L-2301	POWER DISTRIBUTION ASSEMBLY	1.000
7	240L-3301	BASEPLATE ASSEMBLY	1.000
	240L-004	BASEPLATE	1.000
	240L-011-1	FRONT CORNER BRACKET	1.000
	240L-011-2	FRONT CORNER BRACKET	1.000
	240L-012-1	REAR CORNER BRACKET	1.000
	240L-012-2	REAR CORNER BRACKET	1.000
	A300-016	CAPACITOR CLAMP	1.000
13	240L-4303	PS TRANSISTOR BOARD	1.000
	240L-015	POWER SUPPLY HEATSINK	1.000
14	240L-4304	PS REGULATOR BOARD	1.000
8	240L-3303	BACK PANEL ASSEMBLY	1.000
	240L-003	BACK PANEL	1.000
9	240L-3304	FRONT PANEL ASSEMBLY	1.000
	240L-001	FRONT PANEL	1.000
15	240L-4305	RF VOLTMETER BOARD	1.000
3	240L-3306	PA HEATSINK ASSEMBLY	1.000
	240L-006-2	LEFT PA HEATSINK	1.000
	240L-008	PC BOARD BRACKET	1.000
	240L-014	HEATSINK FIN	1.000
10	240L-4301	POWER AMPLIFIER BOARD	1.000
4	240L-3307	DRIVER/COMB HEATSINK ASSEMBLY	1.000
	240L-007	DRIVER HEATSINK	1.000
11	240L-4302	DRIVER COMBINER BOARD	1.000
5	240L-3308	RIGHT P A HEATSINK ASSY	1.000
	240L-006-1	RIGHT PA HEATSINK	1.000
	240L-008	PC BOARD BRACKET	1.000
	240L-014	HEATSINK FIN	1.000
12	240L-4301	POWER AMPLIFIER BOARD	1.000
6	240L-3310	COVER ASSEMBLY	1.000
	240L-010	COVER	1.000

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-TM	MANUAL 240L	1.000	
10017	CABLE ASSY CA2-2 9.5"	1.000	
10026	CABLE ASSY CA4-2 18.0"	4.000	
240L-005-H50	HARNESS GROUP	1.000	
240L-009	RACK MOUNTING BRACKET	2.000	
240L-2301	POWER DISTRIBUTION ASSEMBLY	1.000	
240L-3306	PA HEATSINK ASSEMBLY	1.000	
240L-3307	DRIVER/COMB HEATSINK ASSEMBLY	1.000	
240L-3308	RIGHT P A HEATSINK ASSY	1.000	
240L-3310	COVER ASSEMBLY	1.000	
5030	BOX 19.14 X 13.04 X 10.10	1.000	
5115	SMALL CORNER PADS	8.000	

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04/15/93 ASSEMBLY : 240L-2301

POWER DISTRIBUTION ASSEMBLY

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PART NUMBER      DESCRIPTION      QTY      REFERENCE DESIGNATORS
-----
240L-3301        BASEPLATE ASSEMBLY      1.000
240L-3303        BACK PANEL ASSEMBLY     1.000
240L-3304        FRONT PANEL ASSEMBLY    1.000
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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-006-2	LEFT PA HEATSINK	1.000	
240L-008	PC BOARD BRACKET	1.000	
240L-014	HEATSINK FIN	1.000	
240L-4301	POWER AMPLIFIER BOARD	1.000	
10633	SWITCH 2450-088-105 ELMSENSORS	1.000	TS1
10676	TRANSISTOR 2N5039	4.000	
2372	STANDOFF HEX BRASS 4-40 X .50	4.000	

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04/15/93 ASSEMBLY : 240L-3307

DRIVER/COMB HEATSINK ASSEMBLY PAGE 4

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PART NUMBER      DESCRIPTION      QTY      REFERENCE DESIGNATORS
-----
240L-007         DRIVER HEATSINK         1.000
240L-4302        DRIVER COMBINER BOARD   1.000
10676            TRANSISTOR 2N5039       2.000
681070           TRANSISTOR, 2N3733      1.000
2371             STANDOFF RND BRASS 4-40 X .375 4.000
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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-006-1	RIGHT PA HEATSINK	1.000	
240L-008	PC BOARD BRACKET	1.000	
240L-014	HEATSINK FIN	1.000	
240L-4301	POWER AMPLIFIER BOARD	1.000	
10676	TRANSISTOR 2N5039	4.000	
2372	STANDOFF HEX BRASS 4-40 X .50	4.000	

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04/15/93 ASSEMBLY : 240L-3310

COVER ASSEMBLY

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PART NUMBER      DESCRIPTION      QTY      REFERENCE DESIGNATORS
-----
240L-010         COVER                1.000
10306            HANDLE /WITH HAND POL. COVERS  1.000
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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-004	BASEPLATE	1.000	
240L-011-1	FRONT CORNER BRACKET	1.000	
240L-011-2	FRONT CORNER BRACKET	1.000	
240L-012-1	REAR CORNER BRACKET	1.000	
240L-012-2	REAR CORNER BRACKET	1.000	
A300-016	CAPACITOR CLAMP	1.000	
240L-4303	PS TRANSISTOR BOARD	1.000	
240L-4304	PS REGULATOR BOARD	1.000	
10114	CAP 8200 MF 75V ALEL	1.000	
10660	TRANSFORMER 240L	1.000	
121007	BRIDGE 35A 400V	1.000	
10276	FEET PLASTIC 760-3572	4.000	
10646	TERM BLK 6 TERM 6-172	1.000	
10651	MARK STRIP 6 TERMS	1.000	

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-003	BACK PANEL	1.000	
10261	FAN TUBEAXIAL 4.68"SQ 113CFM	1.000	B1
10290	FUSE 3AB CER SLOBLO 8A 250V	1.000	F1
10298	FUSE HOLDER 1 342001L	1.000	
10341	LINECORD A 18/3	1.000	
10627	SWITCH 115/230	1.000	
10265	FAN FILTER 06450-M	1.000	
10347	CLAMP LINECORD	1.000	

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-3304-C1	INPUT CABLE ASS'Y	0.000	
240L-001	FRONT PANEL	1.000	
240L-4305	RF VOLTMETER BOARD	1.000	
10176	CONN RCPT BNC PNL 50 OHM	1.000	
11114	CONN ADAPT BNC BULKHEAD 50 OHM	1.000	
10333	LAMP INCNDSNT 28V 327	1.000	
10334	LAMP RED	1.000	
10384	METER 4.5" 45/40 MIL 840-586D	1.000	M1
10620	SWITCH ST42A	1.000	

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
030-04-26-1F-50	TOROID	2.000	T2,7
035-03-26-1C-50	TOROID	4.000	T3,4,5,6
035-03-26-1F-50	TOROID	2.000	T1,8
040-01-26-1F-50	TOROID	2.000	T9,10
10065	CAP .1 MF 50V CER RAD	2.000	C17,18
10066	CAP .47MF, 50V	6.000	C5-8,13,14
10092	CAP 510 PF 300V 5% MICA RAD	1.000	C23
10094	CAP 1200 PF 300V 5% MICA RAD	12.000	C1,2,9,12,15,16,19-22
10143	CHOKE, PHEN, 4.7UH, 10%, Q33, 7.9MH	4.000	L1,2,3,4
221117	CONN. "SMB" REAR MOUNT SOLDER	2.000	
10423	POWER AMP PCB A-3	1.000	
120005	RES C-FILM 22 OHM 1/2W 5% C7	2.000	R10,11
120009	RES C-FILM 82 OHM 1/2W 5% C7	4.000	R12-15
1000004	RES MTL FILM 24 OHM 1W 5%	1.000	R1
2000005	RES MTL FILM 20 OHM 2W 5%	20.000	R16-35
2000006	RES MTL FILM 24 OHM 2W 5%	4.000	R36,37,46,47
2000010	RES MTL FILM 51 OHM 2W 5%	2.000	R38,39
2000013	RES MTL FILM 100 OHM 2W 5%	8.000	R2-9
2000022	RES MTL FILM 910 OHM 2W 5%	4.000	R40-43
10705	SOCKET TRANS 2 PINS 2TS-3	4.000	

PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
030-04-26-1F-50	TOROID	2.000	T6,9
031-04-26-1F-50	TOROID	3.000	T1,7,8
035-03-26-1C-50	TOROID	2.000	T2,3
040-01-26-1F-50	TOROID	1.000	T5
048-02-28-1F-50	TOROID	1.000	T4
10065	CAP .1 MF 50V CER RAD	2.000	C1,5
10066	CAP .47MF, 50V	7.000	C3,8-10,12,14,15
10081	CAP 68 PF 300V 5% MICA RAD	2.000	C23,26
10083	CAP 100 PF 330V 5% MICA RAD	1.000	C18
10085	CAP 130 PF 300V 5% MICA RAD	1.000	C22
10093	CAP 560 PF 300V 5% MICA RAD	1.000	C11
10094	CAP 1200 PF 300V 5% MICA RAD	7.000	C16,17,19,20,21,24,25
10104	CAP 10 MF 10V TANT AXIAL	1.000	C2
10106	CAP 10 MF 35V TANT AXIAL	1.000	C6
10107	CAP 22MF,50V ELEC. AXIAL	1.000	C7
10138	CHOKE, PHEN, .68UH, 10%, Q50	1.000	L1
10140	CHOKE, PHEN, 1UH, 10%, Q50, 25MHZ	1.000	L5
10142	CHOKE, PHEN, 3.3UH, 10%, Q33, 7.9MH	2.000	L3,4
11419	CHOKE 10 MH	1.000	L2
10176	CONN RCPT BNC PNL 50 OHM	2.000	
221117	CONN. "SMB" REAR MOUNT SOLDER	4.000	
10424	DRIVER COMBINER PCB A-4	1.000	
120009	RES C-FILM 82 OHM 1/2W 5% C7	2.000	R22,23
120016	RES C-FILM 330 OHM 1/2W 5% C7	1.000	R10
120027	RES C-FILM 1.5K OHM 1/2W 5% C7	1.000	R7
140003	RES C-FILM 10 OHM 1/4W 5% C7	1.000	R5
140020	RES C-FILM 150 OHM 1/4W 5% C7	1.000	R38
140021	RES C-FILM 180 OHM 1/4W 5% C7	1.000	R24
140023	RES C-FILM 240 OHM 1/4W 5% C7	1.000	R11
140028	RES C-FILM 390 OHM 1/4W 5% C7	2.000	R3,4
140039	RES C-FILM 1.8K OHM 1/4W 5% C7	1.000	R37
140049	RES C-FILM 5.1K OHM 1/4W 5% C7	1.000	R1
1000017	RES MTL FILM 560 OHM 1W 5%	1.000	R8
1000039	RES MTL FILM 15 OHM 1W 5%	1.000	
2000002	RES MTL FILM 12 OHM 2W 5%	1.000	R31
2000005	RES MTL FILM 20 OHM 2W 5%	10.000	R17-21,26-30
2000013	RES MTL FILM 100 OHM 2W 5%	1.000	R32
2000014	RES MTL FILM 120 OHM 2W 5%	1.000	R6
2000016	RES MTL FILM 200 OHM 2W 5%	2.000	R16,25
2000018	RES MTL FILM 300 OHM 2W 5%	3.000	R33,34,35
2000022	RES MTL FILM 910 OHM 2W 5%	2.000	R14,15
10599	RES 50 OHM 12W	1.000	R9
10694	TRANSISTOR ENI-5744	1.000	Q1
10705	SOCKET TRANS 2 PINS 2TS-3	2.000	
10313	HEATSINK 207-CB	1.000	

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PART NUMBER      DESCRIPTION      QTY      REFERENCE DESIGNATORS
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030-04-26-1F-50  TOROID          2.000    T2,7
035-03-26-1C-50  TOROID          4.000    T3,4,5,6
035-03-26-1F-50  TOROID          2.000    T1,8
040-01-26-1F-50  TOROID          2.000    T9,10
10065            CAP .1 MF 50V CER RAD      2.000    C17,18
10066            CAP .47MF, 50V            6.000    C5-8,13,14
10092            CAP 510 PF 300V 5% MICA RAD 1.000    C23
10094            CAP 1200 PF 300V 5% MICA RAD 12.000   C1,2,9,12,15,16,19-22
10143            CHOKE, PHEN, 4.7UH, 10%, Q33, 7.9MH 4.000    L1,2,3,4
221117          CONN. "SMB" REAR MOUNT SOLDER 2.000
10423            POWER AMP PCB A-3          1.000
120005          RES C-FILM 22 OHM 1/2W 5% C7 2.000    R10,11
120009          RES C-FILM 82 OHM 1/2W 5% C7 4.000    R12-15
1000004         RES MTL FILM 24 OHM 1W 5%    1.000    R1
2000005         RES MTL FILM 20 OHM 2W 5%    20.000   R16-35
2000006         RES MTL FILM 24 OHM 2W 5%    4.000    R36,37,46,47
2000010         RES MTL FILM 51 OHM 2W 5%    2.000    R38,39
2000013         RES MTL FILM 100 OHM 2W 5%   8.000    R2-9
2000022         RES MTL FILM 910 OHM 2W 5%   4.000    R40-43
10705          SOCKET TRANS 2 PINS 2TS-3    4.000

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
240L-015	POWER SUPPLY HEATSINK	1.000	
10445	POWER SUPPLY PCB A-36	1.000	
10580	RES MTL FILM .1 OHM 2W 10%	3.000	R1,2,3
10678	TRANSISTOR 2N4233A	1.000	Q1
10684	XSTR RFPWR NPN 200W 140V ENI-1	3.000	Q2,3,4
10310	HEATSINK 170-HC	3.000	
10311	HEATSINK 172-HC	1.000	

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
10063	CAP .033 MF RPE121Z5U333M50V	1.000	C1
10093	CAP 560 PF 300V 5% MICA RAD	1.000	C3
10108	CAP 47 MF TLB1J470MAA	1.000	C2
10238	6.2 ZENER DIODE 1N753A	2.000	CR1,2
10327	IC POS ADJ OUTPUT VLTG REG 1CKT	1.000	IC1
10408	RES POT 200 OHM 72PLR200	1.000	R3
10443	PS REGULATOR PCB A-30	1.000	
140043	RES C-FILM 2.7K OHM 1/4W 5% C7	1.000	R2
140051	RES C-FILM 6.2K OHM 1/4W 5% C7	1.000	R1
140062	RES C-FILM 30K OHM 1/4W 5% C7	1.000	
1000019	RES MTL FILM 750 OHM 1W 5%	2.000	R4,5
10644	TERM BLK 4 TERM 4-172	1.000	

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PART NUMBER	DESCRIPTION	QTY	REFERENCE DESIGNATORS
10065	CAP .1 MF 50V CER RAD	1.000	C1
10176	CONN RCPT BNC PNL 50 OHM	1.000	
10249	G.P.SCHOTTKY BARRIER DIODE	1.000	D1
10410	RES POT 500 OHM	1.000	R6
10442	RF VOLTMETER PCB A-29	1.000	
120037	RES C-FILM 4.7K OHM 1/2W 5% C7	3.000	R1,2,3
140007	RES C-FILM 22 OHM 1/4W 5% C7	1.000	R8
140028	RES C-FILM 390 OHM 1/4W 5% C7	1.000	R4
140035	RES C-FILM 1K OHM 1/4W 5% C7	1.000	R5
140044	RES C-FILM 3K OHM 1/4W 5% C7	1.000	R7

Glossary of Abbreviations

A	Amperes
AMP	Amperes
ASSY	Assembly
BR	Bridge
CAP	Capacitor
CER	Ceramic
DESIG	Designation
ELECT	Electrolytic
FWD	Forward
IC	Integrated Circuit
K	Kilohms
k Ω	Kilohms
mV	Millivolts
pF	Picofarad
PIV	Peak Inverse Power
PWR	Power
POT	Potentiometer
REF	Reference
REQ	Required
RFL	Reflected
RES	Resistor
S.B.	Slow Blow
μ F	Microfarad
μ F	Microfarad
μ H	Microhenry
μ H	Microhenry
V	Volts
VDCW	DC Working Voltage
W	Watts
WW	Wire Wound